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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/699,396	10/31/2000	Shyam S. Bayya	79693	9262

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Associate Counsel Patents Code 1008.2
Naval Research Laboratory
4555 Overlook Ave S W
Washington, DC 20375-5320

EXAMINER

CLEVELAND, MICHAEL B

ART UNIT	PAPER NUMBER
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1762

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DATE MAILED: 05/28/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/699,396

Applicant(s)

BAYYA ET AL.

Examiner

Michael Cleveland

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 October 2000.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 October 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.
2. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: The claimed ranges of 1) velocities of 0.1-100 cm/s; 2) heat treating temperatures of 200-2000 °C; and 3) heat treating times of 0.1-5 hours do not find explicit support in the body of the specification. In addition, the phrase "to improve integrity of the coating material" does not find support in the specification.

Drawings

3. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed. See attached PTO-948.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-3 and 13-15: The claims are unclear because they use terminology that appears to conflict with the terminology used in the body of the specification. For instance, the specification teaches a method of spray drying particles with a precursor solution and ~~the~~ heat treating the material to decompose the precursor to oxides. (See p. 10, 12, Examples). On p. 9, Applicant suggests that the particles are spray dried to remove volatile matter and then heat treated to decompose the material. However, the claims imply that the removal of volatile matter occurs during the heat treating (i.e., decomposition) step (especially given claims 3 and 15,

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which differentiates the heating during the spray drying steps from ^{heat}the during the decomposition step) Also, the scope of the claim "coating material" is unclear. Is it inclusive or exclusive of the precursor? Claim 1, step (c) and claim 13, step (e) imply that the coating material is the precursor material. However, then it is not clear how Applicant keeps the precursor in the solution from contacting the particles before spraying as claimed in claims 2 and 14. in BC
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Because of the uncertainty in the claims and based on the specification, the claims have been interpreted as at least inclusive of forming a slurry of particles in a precursor-containing solution, spray drying the particles, and then heating the particles to decompose the precursor into an oxide-containing film.

Claims 4-5, 16-17: The basis of the dilution ratio is unclear. The specification implies that the value is in units of g solid particles/ml liquid. Further, the limitation as to the particle velocity is unclear. As indicated by Masters, the droplet velocity may be measured in any direction (See pp. 286 and 288.) Therefore, the claimed velocities are unclear because they do not specify a direction in addition to a magnitude.

Claims 3 and 10: The claims are unclear because parent claim 3 limits the precursors to several types. However, child claim 10 explicitly claims precursors that are not species of those types (e.g., sodium phosphate).

Claim 13: The term "the precursor(s)" is unclear because only one precursor has been mentioned. The term "electrically conducting crystalline" is unclear because at least one word appears to be missing. The phrase "to improve integrity of the coating material" is unclear. Applicant provides no definition of the phrase in the specification, and the phrase is not recognized in the art. The phrase has been interpreted as at least inclusive of forming a decomposing a precursor to form an oxide with desired properties.

Claim 14 is unclear because it depends from nonexistent claim 123. The Examiner assumed that claim 13 was intended.

Claims 6-9, 11-12, and 18-19 are rejected primarily as containing the flaws of the parent claims.

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it

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pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 2-12 and 14 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. It is not clear how Applicant prevents the precursor within the slurry from contacting the particles before spraying, nor how such can be prevented, as appears to be claimed.

8. Claims 1-9 and 11-19 rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the formation of metal oxide coating from metal precursors, does not reasonably provide enablement for the formation of organic coatings or organic/inorganic hybrid coatings. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims. Applicant disclosure and Examples are limited to the formation of oxide coatings formed by decomposing metal-containing precursors. Thus, Applicant effectively claims at least any reaction to form any material from any other material. However, there is no guidance for the practice of the formation of other coatings than oxides (e.g., reaction to form organic coatings) without undue experimentation.

9. Claim 20 is rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the formation of indium tin oxide, silicon oxide, magnesium oxide, or yttrium-europium oxide for the claimed precursors, does not reasonably provide enablement for the formation of sodium phosphate, without the use of a sodium or phosphorus-containing compound. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make the invention commensurate in scope with these claims.

Claim Objections

10. Claim 9 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Any coating must be organic, inorganic, or a hybrid thereof.

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11. Claims 10, 11, 15, 20 objected to because of the following informalities: "acetyl" is misspelled in claims 10 and 20. Applicant alternates "ZnS:Ag,Cl" and "ZnS:Ag.Cl" throughout the specification and claim 11. "ZnS:Ag,Cl" appears to be more consonant with the prior art usage. Claim 15 uses "dydrides" where similar claim 3 and the specification use "hydrates". Appropriate correction is required.

Claim Rejections - 35 USC § 102

12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

13. Claim 1-2 and 13-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Petersen (U.S. Patent 5,747,100, hereafter '100).

'100 teaches

(a) preparing a liquid precursor solution by adding solid particles to a liquid coating solution to form a liquid coating slurry (col. 6, lines 41-45) containing a coating precursor (e.g., salts of Zn, Ga, and Gd), dissolved in water (a solvent for the precursor) (col. 6, lines 23-37) and the solid particles (col. 6, lines 41-45);

(b), (c) spray drying (i.e., spraying the slurry to form at least some droplets that contain at least one particle and passing the droplets through a zone where the droplets are dried) to form particles coated with a coating material (col. 6, lines 45-47)

(d) heat treating the coating material to decompose the precursors to form a final coating material (col. 6, lines 50-62). The step must inherently remove any remaining solvent, as well as the decomposition products that to not form part of the oxide coating.

Claim 13: Step (a), above may be performed by (a1) preparing a liquid precursor solution by dissolving a coating precursor in a liquid precursor solvent (col. 6, lines 23-33), (b1) mixing the precursor solution with urea (a diluent miscible with water) (col. 6, lines 33-37), and (c1) adding the phosphor particles (col. 6, lines 41-45). The heat treatment causes crystallization

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to form an electrically conducting film (col. 6, lines 60-62). Therefore, it appears to necessarily improve the integrity of the coating material.

Claims 2 and 14: As far as the claims are understood, it appears to be anticipated because the formation of the final coating material does not occur until after the particles have been coated by spray drying (col. 6, lines 50-62).

Claim Rejections - 35 USC § 103

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

16. Claims 3-9, 12, 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Petersen '100 in view of Masters (*Spray Drying Handbook*, 4th edn.; John Wiley & Sons, New York, 1985 (TP 363.M38), hereafter Masters).

Claims 3 and 15: '100 is discussed above. It further teaches that the precursors may be nitrates (col. 6, lines 23-28). It does not teach that the spray drying occurs by spraying into a zone with an elevated temperature that is less than the decomposition (i.e., heat treatment) temperature.

However, spray drying is typically performed by spraying into a heated atmosphere, wherein the application of heat aids the drying process (Masters, p. 3). Typical temperatures for the spraying zone are in the range of 90-125 °C (Masters, p. 30). Therefore, it would have been

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obvious to one of ordinary skill in the art at the time the invention was made to have spray dried the particles of '100 into a heated zone at a temperature of 90-125 °C because Masters teaches that such heating aids in drying the particles, and teaches that such temperatures are operative for spray drying. These temperatures are lower than the disclosed decomposition (i.e., heat treatment) temperature of 300-1000 °C disclosed by '100 (col. 6, lines 45-62).

Claims 4-5, 7, 16-18: '100 teaches a particles size (i.e., diameter) of 3-10 microns (col. 6, lines 47-50) and a thickness of less than 1 micron (1000 nm) (col. 6, lines 47-50). The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a *prima facie* case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

'100 does not teach particular dilution ratios, droplet velocities, or residence times for the spray drying process. However, the concentration of feed solids (i.e., the dilution ratio) is known to affect the coarseness of the spray, evaporation characteristics, and bulk density (Masters, p. 54). Likewise, the droplet velocity affects droplet size (Masters, p. 54, p. 179, 213, 273-292). Residence time is known to affect the degree of moisture removal (Masters, p. 55, 145-147, 151, 320-333). It would have been obvious to have optimized these variables through routine experimentation to have achieved desired droplet sizes and degrees of moisture removal because the determination of the optimum or workable ranges of result-effective variables, such as these, represents mere routine experimentation to one of ordinary skill in the art. See MPEP 2144.05.II. and the cases listed therein.

Claims 5 and 17: As stated above, spray drying temperatures of 90-125 °C are common in the art (Masters, p. 30). The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a *prima facie* case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

Claim 6: The precursor material is mixed with urea, a water-soluble material (i.e., a material miscible with the solution) ('100, col. 6, lines 33-35).

Claims 7-8, 18-19: The particles to be coated are phosphors ('100, col. 5, lines 23-34). The decomposition temperature is 300-1000 °C, and the decomposition time is less than 5 hours ('100, col. 6, lines 45-62). The subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by the reference because overlapping ranges have been held to be a *prima facie* case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

Claims 9 and 19: The coating is inorganic (col. 6, lines 56-57).

Claim 12: The coating (30) may be further coated (Fig. 3; col. 8, lines 1-40).

17. Claims 10 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Petersen '100 in view of Masters and further in view of Hanneman (U.S. Patent 5,063,267, hereafter '267) and Chau (U.S. Patent 5,196,229, hereafter '229).

'100 and Masters are described above for the formation of an oxide coating, as described in col. 6. However, '100 also teaches the formation of other oxide coatings (col. 7-8). In particular, diffusion barriers prepared from a solution containing "ethyl silicate" by substantially the same method as the oxide coating process is described (col. 7, lines 1-34).

The teaching does not clearly indicate that the diffusion barrier is formed from silicon oxide, nor that tetraethyl orthosilicate is the particular ethyl silicate precursor used. However, one of ordinary skill in the art would have understood that '100 describes a decomposition reaction to form a silica film because the context of '100 is the decomposition of metal precursor compounds to form metal oxide coatings on particles (See above.), because the formation of silica coatings as diffusion barriers via decomposition of silica precursors is well known in the art (See, for instance, '267; col. 8, lines 28-54 and col. 10, lines 21-27), and because the formation of silica films by decomposition of ethyl silicates (in particular, tetraethyl orthosilicate (TEOS)) is known (See, for instance, '229, Example 1). Therefore, taking the references as a whole, it would have been obvious to have used TEOS as the particular "ethyl silicate" of '100 to have formed a silica diffusion barrier coating because '267 teaches that silica is a useful diffusion barrier material and because '229 teaches that TEOS decomposes to form silica at temperatures within the disclosed treatment range of '100, col. 7, lines 6-10.

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18. Claims 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Petersen '100 in view of Masters and further in view of Hanneman '267 and Chau '229, as applied to claim 10, above, and further in view of Ohoshi et al. (U.S. Patent 5,949,184, hereafter '184).

'100, Masters, '267, and '229 are described above, but do not explicitly teach that the phosphor is ZnS:Ag,Cl. However, '100 seeks to form phosphors for use in field emission displays (FEDs) (col. 1).

'184 teaches that fluorescent films of FEDs (col. 1, lines 1-10) may be formed from phosphors such as ZnS:Ag,Cl (col. 9, lines 38-51). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used ZnS:Ag,Cl as the particular phosphor of '100 with a reasonable expectation of success because '184 teaches that ZnS:Ag,Cl is a suitable FED phosphor.

Conclusion

19. Claims 1-20 are present in the case. Claims 1-20 are rejected under 35 USC 112, 2nd paragraph. Claims 1-20 are rejected under 35 USC 112, 1st paragraph. Claims 1-2 and 13-14 are rejected under 35 USC 102(b). Claims 3-12 and 15-20 are rejected under 35 USC 103(a). Claims 9-11, 15, and 20 are objected to. The specification is objected to. The drawings are objected to.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Cleveland whose telephone number is (703) 308-2331. The examiner can normally be reached on 9-5:30 M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive Beck can be reached on (703) 308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 306-3186 for regular communications and (703) 306-3186 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

MBC

MBC
May 21, 2002

Shrive P. Beck

**SHRIVE P. BECK
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700**